REPORT

OF THE

COMMITTEE

APPOINTED TO INQUIRE INTO THE

BUILDINGS AND SITE

OF THE

ROYAL COLLEGE OF SCIENCE FOR IRELAND, DUBLIN.

Presented to both Houses of Parliament by Command of Her Majesty.

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COMMITTEE ON THE ROYAL COLLEGE OF SCIENCE FOR IRELAND.

ORDER OF REFERENCE.

On February 13th, 1897, the Lord President of the Council approved the following Minute, that "a Committee should report what new buildings are required, " whether they can be added to the existing College, or " whether an entirely new site should be obtained; and " if the latter, where it should be, and what should be " done with the existing College," and he appointed Mr. J. G. Barton, F.S.I., Commissioner of Valuation, Ireland; Mr. R. W. A. Holmes, C.B., Treasury Remembrancer, to form the Committee, with Captain W. de W. Abney, C.B., F.R.S., Director for Science, Science and Art Department, as Chairman.

REPORT.

TO HIS GRACE THE DUKE OF DEVONSHIRE, K.G., LORD PRESIDENT OF THE COUNCIL.

MY LORD DUKE,

WE, the Committee appointed under your Grace's Minute of 13th February 1897, have carefully considered the several questions which have been referred to us therein. Before making our report, we felt that it would be desirable to ascertain the views of the various public bodies and persons interested in the subject of Technical Education in Ireland as regards some of the points submitted. We therefore communicated with the following Bodies which have taken a leading part in connection with Scientific Instruction, viz.:—

Corporations of Dublin, Belfast, and Cork,
Board of Trinity College,
Royal University,
Chambers of Commerce: Dublin, Belfast, and Cork,
Queen's Colleges of Belfast, Cork, and Galway, and
Dublin United Trades Council.

We also had interviews with the following gentlemen and deputations:—

Very Rev. Monsignor Molloy.
Right Hon. J. M. Meade.
Professor G. F. FitzGerald.
Professor M. F. FitzGerald.
Professor Rücker.
Professor Barrett.
Mr. T. P. Gill, Secretary of the Recess Committee.
Mr. Arnold Graves.
The Technical Educational Association for the City of Dublin.
The Irish Industrial League.

Some of the above have handed in statements which are set out in the Appendix. From the interviews and statements we have concluded that, though there was some variance of opinion as to the policy of enlarging the College of Science pending the final settlement of the whole subject of technical education by the Government, the majority were in favour of the erection of a new and extended College contiguous to the Science and Art Museum in Kildare Street, and that the curriculum of the College should be enlarged by adding more practical work without interfering with the pure science at present taught.

The questions which have been referred to us are as follows:—

(1.) What new buildings are required?

(2.) Whether they can be added to the existing College, or whether an entirely new site should be obtained, and, if so, where it should be?

(3.) What should be done with the existing College?

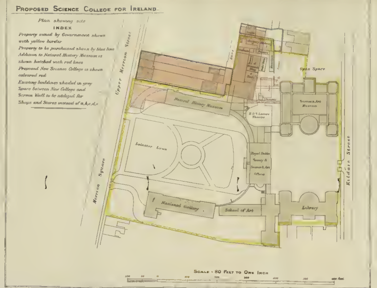
The only question upon which we have felt any difficulty is the first, and we shall, therefore, deal with the others before referring to it.

There can be no doubt that the existing College is not suitable—the buildings being very inconvenient and containing only about 53,000 square feet of floor space; while, even if more space were obtainable, which could only be by purchasing at a considerable cost the adjacent houses, the existing building would have to be wholly reconstructed. The site, too, of the existing College is not the most convenient, so that neither on the ground of convenience nor of economy should we be justified in recommending that the new buildings be added to it.

There can also, we think, be no doubt, that a Central Science College for Ireland should be in Dublin, not only because it is the capital and seat of Government, but also on account of its geographical position, the facilities of communication by rail with Belfast, Derry, Galway, Limerick, and Cork, and the fact that the principal higher educational institutions, such as Trinity College, the Catholic University, and the Royal University, are situated there. We also think that the new College should be contiguous to the Museum buildings. This, while ensuring a central and suitable site, would enable the College to benefit by the use of the Geological, Botanical, and other Museum collections, whilst the public generally would have greater facilities for studying the scientific instruments, &c. now exhibited in the College museum. A site such as this would, we feel, clearly indicate that the College would be not a mere adjunct to Dublin Technical Schools, but for the benefit of Ireland in general.

The site which we consider most suitable extends from Kildare Place to Upper Merrion Street, and is shown on the plan attached to our Report. It will require that the temporary annexe and some of the workshops of the Museum should be acquired for the new College, which will necessitate recouping that institution for the loss of this space. We suggest that this be effected by continuing the present Natural History wing to Merrion Street, and the re-erection of some workshops in Kildare Place, as shown. This site would enable a building to be erected giving access to the College both from Kildare Place and Upper Merrion Street.

As to what should be done with the existing College, we agree with the view expressed by the Board of Works in their letter to us of the 23rd April, which is printed in the Appendix, that "until the necessities of the public service at the time of



PROPOSED SCIENCE COLLEGE FOR IRELAND

Plan showing site

INDEX

Property owned by Government shown with yellow border
Property to be purchased shown by blue line
Addition to Natural History Museum is shown hatched with red lines
Proposed New Science College is shown coloured red
Existing buildings shaded in grey
Space between New College and Screen Wall to be utilized for Shops and Stores instead of a, b, c, d, e

SCALE - 80 FEET TO ONE INCH

" surrender by the Science and Art Department have been " ascertained, it is not practicable to form a definite opinion on " the subject. The surrender of the building cannot take place for some years, and in the interval a new department might be created by legislation which might make it necessary to retain the building for the accommodation of the staff.

Returning to the question, " What new buildings are required ?" the difficulty which we feel in dealing with it is of a twofold kind. In the first place, it is doubtful whether we are expected to go into details which assume some professional knowledge, or whether we may content ourselves with a general expression of our opinion that the new College should be up to date in all particulars, and should suffice to provide for any developments which are likely to take place in the field of technical instruction. After much consideration, we have arrived at the conclusion that, having regard to the constitution of the Committee, we are not under the necessity of dealing with the question from the professional standpoint; while we feel that the expression of our opinion in the sense we have just stated will be quite sufficient for the purpose of a reply to the question. This course, moreover, recommends itself to us, because, by adopting it, we shall avoid the further difficulty, viz., that any plan, or hint at a plan, for the construction of the building, even though it should be only suggested for consideration, might at the outset provoke local opposition to the scheme, which it is desirable to avoid.

The approval of a plan should, we think, be left open for consideration by a committee whose constitution would render the adoption of one best suited to the needs of the country more easy than would be the case if it were submitted as a cut-and-dry proposal by a Committee whose qualifications for the task might be questioned.

Our functions will have been discharged in suggesting where the site should be and indicating its maximum limits; and, in arriving at the latter, we have had in view the extended courses of instruction, both theoretical and practical, which will be required when technical instruction has developed, as in England, in the primary and secondary schools.

In conclusion, we desire to tender our thanks to the gentlemen who have been so good as to give us the benefit of the expression of their views on those portions of the question which were within the terms of the reference to us, and to record our sense of the painstaking and efficient manner in which Mr. W. G. Lambert has carried out the duties of secretary to the Committee.

We have the honour to be
Your Grace's obedient servants,
(Signed) W. DE W. ABNEY,
JOHN G. BARTON,
R. W. A. HOLMES.

APPENDIX.

APPENDIX 1.

RESOLUTION adopted by the MUNICIPAL COUNCIL of the CITY OF DUBLIN, 1st March 1897.

The attention of the Corporation having been drawn to the appointment by the Science and Art Department of a Committee to report on the question of the new buildings and site for the Royal College of Science for Ireland, which was founded to supply, as far as practicable, a complete course of instruction in Science applicable to the Industrial Arts, and to aid in the instruction of teachers for local Schools of Science, neither of which objects have been achieved by the College, the Science and Art Department having actually, at present, under consideration the question of the re-organisation of the College for the purpose of better carrying out the objects for which it was founded, which were those of a central technical college for Ireland, an institution for which there is the most urgent need, but which it would be most inadvisable to establish without first consulting Irishmen acquainted with the industrial requirements of the country:—

Resolved, "That the town clerk be accordingly instructed to
" communicate with the Committee of the Science and Art
" Department charged with this inquiry to take no action
" without first consulting the Chambers of Commerce and the
" Corporations of the principal towns in Ireland, and others
" acquainted with the manufactures and industries of the
" country; and that either the Members of the Corporation of
" Dublin, the Board of Governors of the Technical Schools, the
" Technical Education Committee for the City of Dublin, or all
" of these bodies, be given a representation at the Inquiry."

APPENDIX 2.

RESOLUTION adopted by the TECHNICAL EDUCATION COMMITTEE for the CITY OF DUBLIN.

Resolved that the attention of the Dublin Corporation of the Chamber of Commerce, of the Technical Education Association for Ireland, of the Dublin United Trades Council, and of the Departmental Committee appointed to report about the Royal College of Science for Ireland, be called to the following resolution of the Technical Education Committee for the City of Dublin of 19th December 1896:—

"That in view of a scheme for Technical Education for Ireland being proposed by Government the Technical Education Committee for the City of Dublin press upon the Corporation of Dublin, and upon the Government, the importance of providing a first-class Technical College for Ireland, to be located in Dublin, in order to supply the highest form of Technical Education in this country, and train Technical, Science, and other teachers in Technical and Science Subjects for Irish Schools.

"That this Technical College for Ireland should be in intimate relation with Central Technical Schools for the City of Dublin so as to concentrate the resources of the country, ensure the essentially technical character of the College, and provide suitable practising schools for teachers in training.

"That before finally deciding upon the details of any scheme of Technical Education, or the establishment of a Technical College for Ireland, the Corporations of the principal towns, the Chambers of Commerce, the Technical Education Committees, and others interested in Technical Education for Ireland should be consulted.

"That the Corporation of Dublin, the Chamber of Commerce, the Technical Education Association for Ireland, and the Dublin United Trades Council be requested to at once press upon the Departmental Committee the importance of consulting the representatives of the commercial and industrial interests in Ireland before making any final report upon the Royal College of Science for Ireland."

The following is a copy of a resolution subsequently passed by the above body:—

"That while the Technical Education Committee for the City of Dublin are pleased to observe that the Department of Science and Art are willing to comply with the desire for the reorganization of the Royal College of Science, they are strongly of opinion that in view of the statements recently and publicly made by his Excellency the Lord Lieutenant, that it was the intention of the Government to deal with the whole question of Technical Education of Ireland at the earliest possible opportunity, it would be advisable to deal with the subject in its entirety, and that a comprehensive scheme of Technical Education for Ireland under an Irish Department should be immediately undertaken and carried out."

APPENDIX 3.

MEMORANDUM by Monsignor MOLLOY, Rector of the Catholic University and Member of the Council of the TECHNICAL EDUCATION ASSOCIATION OF IRELAND.

I understand that it is proposed so to develop and enlarge the College of Science as to make it a great central institution for higher technical education in Ireland. This project has my entire and cordial approval, and I have no doubt it will be attended by great advantages to the country, always supposing that the College is placed under a governing body known to the people and enjoying their confidence,

As regards the site suggested, namely, the area extending from Kildare Place to Upper Merrion Street, and including the houses at both ends, I think it is an excellent site, and I do not know of any better. An objection, I believe, has been made, that it is too far removed from the districts inhabited by the working classes; but this objection does not seem to me to have much force. A college for higher technical education is not intended directly for the working classes, but rather for students who have already received a preliminary technical education in Secondary Schools, and who might be expected to come, for more advanced studies, to a Central College, from all parts of the country.

Having said so much directly in answer to the question submitted to me, I may be allowed, perhaps, to qualify this summary expression of opinion by a short explanation of my views on the subject generally. In the first place, it seems to me clear that a college for higher technical education ought not to stand alone, but ought to be part of a comprehensive and well-considered scheme for technical education extending over the whole country, and taking in all classes of the community. Such a scheme should provide a graduated course of technical instruction and training from the lowest to the highest stage, and should include—I. Primary technical education; II. Secondary or intermediate technical education, and III. Higher technical education. I will say a few words under each of these heads.

I. Primary technical education would be entirely elementary, and should be given to all children in the primary schools of the country. It would include Kindergarten system for infants, and for the more advanced children (*a*) Drawing and Modelling, (*b*) manual instruction and manual training, and (*c*) the rudiments of Physical Science, with object lessons and simple experiments.

II. For secondary or intermediate technical education, a new class of schools would require to be established, more advanced than the primary schools, and having a *distinctly industrial bent.* These schools might be called Advanced Primary Schools, or Intermediate Technical Schools. They might be established in the first instance in the larger towns, and afterwards extended to smaller towns; and they should be open to all pupils who have passed through the primary schools, and whose parents desire for them a more advanced education. The programme of these schools should be, in the main, industrial and commercial, regard being had in each case to the circumstances of the locality in which the school is situated; but the literary education of the pupils should, at the same time, be carried to a higher stage than in the primary schools.

The ordinary course of education given in these Intermediate Technical Schools, should be supplemented by the establishment of evening classes, or continuation schools, in which technical instruction and training would be given to those who have left school, and are engaged in the business of life. These classes might be organised by local committees; and a very wide latitude should be allowed to each committee as regards the programme of instruction, which should be suited, in each case, to the wants of the pupils and the circumstances of the locality.

III. Higher technical education would be provided for in the Central Technical College, which would hold the same relation to the schools above described as a University College holds to the existing intermediate schools of the country. Students would come to it from the Intermediate Technical Schools, fitted by their previous training to profit by its more advanced teaching, and to prepare themselves for the higher branches of an industrial career, as Mechanical Engineers, Civil Engineers, Electrical Engineers, Mining Engineers, or as the heads or superintendents of industrial and manufacturing works.

The question now presents itself, in what order such a graduated course of technical education as I have just sketched out might best be introduced into Ireland. The Government has recently appointed a commission to consider and determine "how " far, and in what form, manual and practical instruction should " be included in the educational system of the primary schools " under the Board of National Education." This is a very important step; and there is reason to hope that the outcome of this commission will be to provide a fairly comprehensive scheme for what I have called Primary Technical Education.

It remains, therefore, to provide for Intermediate and Higher Technical Education. If I had a choice in the matter, I should prefer to build from below upwards; to begin with Intermediate Technical Schools, and to follow on with a central college for more advanced studies. The schools must be the feeders of the college; and we cannot expect to have any large number of students available to enter the college till they have been trained in the Intermediate Schools, and so fitted to profit by a higher course.

But if for any reason it be decided not to follow the order I have suggested, I should still welcome the establishment of a

Central College for higher technical studies in Dublin; first, because it could be usefully employed, even from the outset, in advancing the cause of technical education; and secondly, because its existence would furnish an overwhelming argument for the subsequent establishment of Intermediate Technical Schools. As the project of such a College is now under consideration, I may be allowed, perhaps, to indicate some directions in which, as I think, it might be developed with advantage, at the present moment.

(1.) First, I would suggest the immediate and ample equipment of a Department of Electrical Engineering. A considerable number of young men, of late years, have acquired, in the schools and colleges of the country, a good knowledge of Mathematics and an acquaintance with the general principles of Electricity. They would be, therefore, prepared to enter at once on a special course of Electrical Engineering, which offers, as I think, a fine opening for a career in life.

(2.) Again, the present College of Science possesses a very large and valuable collection of physical apparatus, and has a great number of instruments in duplicate and triplicate. Now it appears to me that some of the advantages of this collection might be brought home to a much wider circle of students if it was judiciously laid out for inspection and examination, in some large hall to which the public would have access. Many teachers of Physics in the schools and colleges of Dublin and its neighbourhood would be glad, I think, to take their pupils from time to time to visit such a collection, and explain the apparatus to them on the spot.

(3.) I would even go so far as to suggest that properly qualified professors, from outside the College, might be allowed, under reasonable supervision, to use the apparatus and to show experiments to their pupils, and that a hall in the College should be provided for this purpose. If such a plan could be carried out the advantages offered by this fine collection of apparatus might be brought home to hundreds of students in and about Dublin who are engaged in the study of Physics with very imperfect resources, in connexion with the examinations of the Intermediate Education Board and of the Royal University

(4.) Again, classes might be set up in the Central Technical College for students who may wish to prepare themselves to become teachers of Science in the existing Schools and Colleges. or in the Intermediate Technical Schools to be hereafter established; also for persons already engaged in the teaching of Science.

(5.) Lastly, a research laboratory might be founded in connexion with the College, open, under suitable conditions, to University students and other properly qualified persons, who may wish to devote themselves to original investigations. This research laboratory would be under the control of the professors, and would, of course, be available for themselves and their pupils as well as for students from outside. In the first instance, it might be opened in the departments of Physics and Chemistry; and if found successful it might afterwards be extended to the other branches of Science.

With these developments and an ample endowment I have no doubt that a Central Technical College in Dublin may be made extremely useful, from the outset, to a large body of students, and may prepare the way for the ultimate establishment of a complete system of technical education in the country. But I think it right to say, at the same time, that, in my opinion, it cannot hope to attain any measure of success at all commensurate with its importance as an educational institution, or with the necessary expenditure upon it, unless it is placed under a governing body known to the people of the country, in touch with the people, and having the confidence of the people.

(Signed) GERALD MOLLOY.

March 3, 1897.

APPENDIX 4.

MEMORANDUM BY MR. T. P. GILL, HON. SEC. OF THE RECESS COMMITTEE.

The Committee of Inquiry on the Royal College of Science have done me the honour to invite me, as one who has taken part in the inquiries and deliberations of the Recess Committee, to submit a memorandum on the above subject. I must disclaim any pretension to speak as an expert on this matter. These remarks are simply offered from the standpoint of an ordinary layman, who has endeavoured to obtain some information on a subject in which he takes a keen interest.

§ 1.

As I understand the question put by the Committee, it presents itself to me thus:—The Government are willing to consider the advisability of improving the Royal College of Science, and making it a Central Technical College for Ireland, and if this is advisable, making a considerable building grant from Imperial funds for the purpose. The question is, do the friends of Technical education in Ireland consider it advisable that such a Technical College should now be established, and if so, on what lines and in what place?

§ 2.

That question must be viewed, in the first place, in the light of two dominant facts. One is, that all who have considered this subject in Ireland believe that a comprehensive system of Technical Instruction as applied both to agriculture and industries is an urgent necessity for this country. (For the most recent evidence of the consensus of opinion on this point, I would refer to the declarations of Irish public bodies since the introduction of the Agriculture and Industries (Ireland) Bill). The second fact is that all who have considered this subject in Ireland are equally agreed that such a system of Technical Instruction cannot be successfully managed by an English department in London, but must be administered by an Irish authority. Whatever diversity of views as to any given details of general subject may exist in Ireland, there is absolute unanimity on this point. For my part, I am convinced that, no matter how perfect or richly equipped the machinery which may be set up, the system will be lifeless and unreal, until it is directed by an Irish Department, working in Dublin, intimately acquainted with the needs of the country, in touch with the people, and even directly advised by the classes of the population concerned in its work.

§ 3.

By the light of these facts we arrive at the conclusion that the College which it is proposed to erect ought to fulfil two conditions:—

(*a.*) It ought to be designed not only without prejudice to, but expressly with a view to fitting in with, a special and comprehensive system of Technical Instruction for Ireland.

(*b.*) It ought to be designed without prejudice to the possibility of its being ultimately administered by an Irish body.

§ 4.

The second of these conditions may be disposed of at once, for if the first be fulfilled, the other would naturally follow. A College of the kind, if completed, would pass over as an asset to the new Irish Department; if unfinished but designed on approved lines, it would be taken over with the building funds appropriated to it, as a work which the new Department would continue.

§ 5.

As to the fulfilment of the first of the two conditions, we have then to consider:—

(1.) Whether it is possible at this stage to arrive at the broad general principles of a system of Technical Instruction for Ireland.

(2.) If so, whether a Central Technical College is a necessary feature of such a system.

(3.) If it be, whether it is desirable to determine on, and to begin, the erection of such a College before the system generally is established.

§ 6.

(1.) *Is it possible at this stage to arrive at the general principles of a system?*

Of course it would be manifestly unsound at this or any other stage to lay down any cut and dried scheme for Ireland. The special conditions, the special individuality of the country must be allowed plenty of scope in the evolution of this scheme, and modification must be provided for as circumstances may determine. I would add that even officials employed in carrying out the system should have more freedom to give to their work the full benefit of their individual intelligence than is possible under too uniform regulations. In a word, if one may so put it, it would be unscientific to set rigid limits beforehand to the development of such a work as this.

But there, nevertheless, seem to be certain main principles for a national system of Technical Instruction now ascertainable from the experience of the world, and it seems an inevitable conclusion that if we import the thing itself, we must import these principles which are vital to it. We must realise that Technical Instruction is a thing to be imported; it is an educational idea which has grown up and been brought to perfection in continental countries, and it is not indigenous to Ireland, or even to Great Britain. France has had over 100 years' experience of the working of Technical Instruction. Germany has had over 50 years' experience. We can observe the working of systems of Technical Instruction for long periods in countries so diverse in their circumstances as Austria, Switzerland, Wurtemburg, Belgium, Bavaria, Hungary. When we find among these several systems, notwithstanding the variety of circumstances, forms of government, methods of educational and economic administration under which they are carried on, that there are certain principles common to them all, it is safe to conclude that a system of Technical Instruction for Ireland, if it is to derive any benefit from the experience of other countries at all, must contain these principles. The task of the statesman or the administrator would be simply to determine from the local conditions of Ireland what peculiar details were necessary to fill out the scheme of which these principles may be taken as the skeleton.

Nor are we now in any fog on this matter as regards Ireland itself. More than one Royal Commission has investigated the requirements of Ireland in respect of Technical Instruction, and made reports thereon. The Royal Commission on Technical Instruction in especial, took great pains to make its investigations exhaustive. It held sittings in Ireland and took evidence from every possible quarter from which guidance might be expected, and backed by the knowledge acquired in its thorough investigations throughout the whole continent of Europe and America, it drew up the outlines of a system of Technical Instruction for Ireland, taking account of local conditions and utilising local material. A more recent investigation of the same subject has been that of the Recess Committee which devoted more than a year to inquiry and study abroad and at home. The Recess Committee, which included amongst its members practical manufacturers, business men, and leading educationalists, likewise drew up the outlines of the scheme of Technical Instruction for Ireland. It is noteworthy that this scheme, framed by the light of a more recent investigation, does not differ in its main principles from the scheme recommended by the Royal Commission. It would be out of place here to give a full description of the Recess Committee's scheme, but I may mention that its main heads were :—(1.) A reform of the teaching of the primary schools. This reform would include drawing, both freehand and industrial (such as plans and designs for simple articles of manufacture and maps of areas actually measured, *e.g.*, the schoolyard); rudimentary Science illustrated by experiments and object lessons (the course being subject to slight modifications according to local condition, *e.g.*, to include Botany in rural districts, Mechanics in urban districts); local geography with maps and charts of the local coast-line, shoals, fishing grounds, soils, mineral resources; manual instruction confined to the principle of imparting handiness to the children; in rural districts a practical agricultural course for the illustration of which the Example Plot provided by the Board of Agriculture and Industries for the district generally would be available. (2.) The creation of a new type of secondary schools to be called "Practical Schools of Agriculture" and "Practical "Schools of Industry and Commerce." These, besides their special scientific and technical purpose were, according to the principle of the French *Écoles Practiques,* to aim at continuing the general education of the pupils, a principle which has now been recommended for the English Organised Science Schools by the Departmental Committee on the Distribution of Grants, which reported within the past couple of months. It was suggested that existing Secondary Schools such as those of the Christian Brothers, and certain High and Intermediate schools might be modified so as to become Practical Schools of this description, and qualify themselves for grants from the Board of Agriculture and Industries. (3.) The establishment of Local Art Schools. (4.) The promotion of Trade Evening Schools and Continuation Schools for youths and artizans engaged at work during the day. (5.) The establishment of higher Technical Colleges for Agriculture and Industry and the endowment of Chairs of Agriculture and Applied Science at Universities.

I think this scheme involves the common principles referred to.

I may add two other principles common to most systems abroad, although they belong rather to the administration of the system than to the system itself. One is that Technical Instruction related to agriculture or industries is administered by the Departments of Agriculture or of Agriculture and Industries rather than by the Educational Departments. I am aware that amongst educationalists in England there is a theory in favour which tends to grouping all forms of educational effort under Educational Departments. We in Ireland, having no such thing as an organised or co-ordinated system of educational administration, are free for the time being to consider our immediate needs without reference to the merits of this theory. But, it may be well to point out that continental experience does not seem to bring this theory support. We not only find Technical Instruction administered in the manner referred to, but it is a very interesting and significant fact that the French Government with their great and highly organised educational department, tried the plan of working Technical Instruction through their Ministry of Education, and have had to give it up. In recent years they have found it wiser to relegate Technical Instruction as related to industries to the care of the Ministry of Industry and Commerce, while their Technical Instruction related to agriculture remains with their Ministry of Agriculture.*

The second general principle to which I refer is the employment of local initiative and local responsibility in co-operation with the State Department, both in the management and support of the system of Technical Instruction. If I may refer to such a topic, I would point out that the County Councils which the Government now propose to establish should, with the municipalities and voluntary associations, furnish Ireland with that machinery for local co-operation which the central department, the Board of Agriculture and Industries, provided by another measure of the Government, would be able to call into play.

§ 7.

(2.) *Is a Central Technical College necessary to such a system?*

So far as the experience of other countries goes, in may be answered that it is. The Central Technical College or Polytechnique, or Conservatoire des Arts et Métiers, for the training of professors and leaders of industry and of agriculture and the pursuit of research, is one of the features which are found common to continental systems.

The Recess Committee, dealing with the circumstances of Ireland itself and with the unpractical and over-literary character of its education, seems to declare that such an institution is at this stage the most urgently needed of these features. It says:—"Since it is from the upper educational grades that "leaders come, and since, if Irish industry had had leaders

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* Article 69 of the law of the 20th January 1892. "L'esprit général "qui a présidé à l'élaboration de ce réglement a été d'assurer la plus "grande liberté aux départements et aux communes pour l'organisation et "l'administration."—"Observations" in the Estimates of the Ministry of Commerce and Industry for 1897, p. 555.

" thoroughly versed in the necessary practical knowledge, and " possessed of a true conception of the industrial requirements " of the country, their influence would have mended the state " of things in the lower grades, we are inclined to say that it is " this higher teaching which is most at fault." (Report p. 88.)

Apropos of these Central Colleges, the Recess Committee calls attention to a fact noted by the Royal Commissioners on Technical Instruction—the superior scientific and practical education of the manufacturers whom they met abroad, as compared with the same class in their own country. Such men at the head of manufactories are not only able to keep their industry abreast of the advance of science, but they have a zeal and appreciation for practical education which extends to the operatives in their employment. The active efforts of these scientifically trained manufactures abroad, not merely in facilitating but in insisting on the attendance of their employés at the Technical Schools and classes, and the lavish support which they give in erecting Technical institutions of various types, constitute one of the main props of the continental systems of Technical instruction.

For the training of leaders of industry of this type, for the training of Professors and for the endowment of research, central Technical Colleges appear to be considered necessary abroad—colleges both for Science as applied to agriculture and for Science as applied to industries.

If the Commission on Manual Instruction reports in favour of some such a reform of the course in primary schools as the Royal Commission on Technical Instruction and the Recess Committee here recommended, the first difficulty which will present itself will be not how to teach the children, but how to teach the teachers. To meet this difficulty the best means, according to continental experience, seems to be a central Technical College, where teachers now attached to schools or those being trained in the Training Colleges could come for a course—not of pedagogy in any form, for that subject belongs to the Training Colleges—but of Practical or Applied Science. Ultimately from such a college would come a supply of professors who might give that course in the Training Colleges direct, and who would be available for manning provincial technical colleges, secondary practical schools and the general system. In 1879, when the French Government resolved to make an agricultural course compulsory in the rural primary schools, they enacted that this regulation should not take effect until three years after its promulgation. During the three years the departmental, or travelling professors of agriculture, who were already at work under the Ministry of Agriculture, were employed to give a course of agricultural instruction to the teachers in training in the normal schools of the Department a course which is a permanent feature of the curriculum. These professors—are mainly the product of the National Agronomic Institute at Paris.

But the most important purpose of a Central Technical College would seem to be scientific research. It appears to be the universal experience that the great industies at the present day depend more and more upon the successful application of scientific discoveries to manufacturing processes and less upon the proximity of raw materials. For the research which leads to such discoveries due provision can only be made in great Technical Institutions of the character of Polytechnics. The value of scientific research is equally great in its application to agriculture. Monsieur Tisserand, Director General of Agriculture in France, in his memorandum to the Recess Committee, points to the immense advantage which the endowment of scientific research, directed hy the French Ministry of Agriculture, through its Agronomic Institute has been to France, and indeed to the world. It was investigations thus assisted which led to some of the great discoveries of Pasteur, Berthelot, Aimé Girard, and other French scientists.

On the question of Central Colleges we have, within the present year, obtained some striking evidence. Twelve years ago the Royal Commission on Technical Instruction made a report on the Technical Instruction system of Germany. Four members of that Commission (Sir Philip Magnus, Messrs. Redgrave, Swire Smith, and Woodall, M.P.), re-visited Germany last autumn. They were thus able to see how far the system they examined twelve years ago had stood the test of the intervening time, and what features of it the German States had found it most profitable to rely upon. Twelve years ago the Commission thought that the Polytechnics then provided were in excess of the requirements of the people and not likely to be utilised; but to-day they find that not only have these polytechnics been utilised, but that they are no longer able to accommodate the pupils who attend them, and they have had to be enlarged. To quote the words of the Commissioners themselves: "While "none of these institutions have been closed, others have been "erected, more modern in construction, more fully equipped, and "better adapted to the now generally recognised need for "practical instruction." The sum of 100,000*l.*, (which, having regard to the relative cost of building materials in Germany, would represent much more than this sum in our circumstances,) has just been spent on additions to the Polytechnic at Stuttgart, the capital of Wurtemburg. At Darmstadt a city of only 75,000 inhabitants, the Polytechnic or Central Technical College, has been reconstructed at an expenditure of about 120,000*l.* The Polytechnic of Hanover has been enlarged, and the Polytechnic of Charlottenburg at Berlin has been extended from its original plan at an expenditure of 450,000*l.*

Whether the judgment of German States in thus placing such importance upon their Central Technical Colleges is worth considering, the enormous growth of German manufacturing industry within recent years, which it is evident they attribute largely to their educational system, is perhaps, a sufficient answer. Indeed, the experience of some of these States would seem to have a special value for Ireland. Fifty years ago, Wurtemburg, which is about the size of Munster, was a purely agricultural country, as backward in industries as Ireland is to-day, and possessing far less natural resources. She is now in the front rank of German manufacturing States. But, as I have said, it is not the German States alone in which Central Technical Colleges form an essential feature of the educational system.

It is important to note too that the existence of a Central Technical College does not interfere with Technical Colleges of a more local character, more strictly concerned with local industries and supported to a greater extent by local bodies, such as Municipalities, Chambers of Commerce, Associations of Manufacturers, and Trades Organisations. Thus, in countries where Central Technical Colleges directed by the State exist, we find such special Technical Colleges as the Weaving Schools of Lyons in France, of Mulhausen in Alsace, of Crefeld in Prussia, of Chemnitz in Saxony, the School for Textile Dyeing in Vienna, the School for Design related to the Ceramic Industries at Limoges.

So far therefore as the argument from foreign experience goes, it seems to be conclusive that a central Technical College is necessary to a system of Technical Education.

§ 8.

(3.) *Is it advisable to determine on and to begin the erection of such a College before the system generally is established?*

I cannot see, if the conditions mentioned at the beginning of this paper are fulfilled, any argument against the advisability of this being done. I see several arguments in favour of it. The Royal College of Science, under its present limitations, admittedly does not fulfil the requirements of a Central College intended to be the crown of a national system of Technical Instruction for Ireland. The College of Science, with its splendid staff of professors, is but the nucleus of such a College. Such a College as continental experience seems to argue, would have to be erected in any case, no matter what authority directs the system of Technical Education in Ireland. The South Kensington Department appears to be willing to begin that building now, and the Treasury appears to be willing to vote money to enable it to do so. Tomy humble judgment, it seems an opportunity to be seized. This session the Government introduced a Bill establishing a Board of Agriculture and Industries for Ireland to deal with Technical Instruction relating to Agriculture and Industries. This fact and the fact that the Scotch functions of South Kensington have been handed over to a Scotch authority, justify the belief that the Department, in undertaking the construction of this necessary College, will be but beginning a work which it will be the privilege of an Irish authority to finish, and securing for that Irish authority a building grant which will be absolutely essential to the carrying out of its mission.

§ 9.

On the further questions, viz., on what lines such a College should be designed and where it should be reected, I do not feel qualified to offer a suggestion. In the foregoing I have confined myself to examining such evidence of continental experience as I have been able to obtain and pointing out the conclusion to which that evidence seems to lead. Beyond that I do not go; and I wish to repeat, in reference to the whole matter, that I speak with diffidence and neccessarily open to correction from those who have special authority to be heard on this subject.

(Signed) Thomas P. Gill,
Hon. Sec. Recess Committee.

APPENDIX 5.

Memorandum by Professor George F. FitzGerald, F.R.S., F.T.C.D.

The two points referred to in the letter requesting a report on the Royal College of Science are :—

(*a.*) What accommodation is required ?
(*b.*) Where the college should be built ?

I understand that no departure from the lines of the present College is within the scope of the inquiry. It is suggested that the usefulness of the college might be materially increased by an extension in the technical side of the subjects already taught, and that the College should be adapted to give the highest form of such instruction.

I entirely agree with the suggestion, but I would go very much further. I believe that such a great extension of the work of the College in the technical direction will be required that it would be most unwise to make any arrangement or extension now, which could be considered as at all final. Not only does the College require extension along its present lines, but those lines require a wide extension. If the College is to be what it ought to be, the crown to the fabric of Technical Education for Ireland, and the Training College for Science and Technical Teachers for Ireland, it will have to be extended in many directions. Until the lines of Technical Education in Ireland have been laid down it is impossible to decide upon the lines that will be suitable for the college that is to complete the system. It would, for instance, be a very great mistake to copy a German polytechnic and plant it down in Dublin as the final outcome of human experience in this line. The German polytechnic is the completion of a system of education which is quite different from that existing in Ireland, or from anything that it is at all probable will be introduced into Ireland. Our system of secondary education is made on the plan of secondary schools with classical sides and modern sides, instead of upon the plan of gymnasiums and *real schulen*. As at present worked our Irish plan is not at all satisfactorily developed in the Science and Technical directions, but there is no reason why the plan of classical and modern sides should not produce as satisfactory Science and Technical results as the German plan. I have no doubt that when judiciously developed our plan is capable of better results. It does not separate the various classes of the community into different schools during their youth, but by bringing them up in contact with one another, tends to fuse the different classes together, and to prevent that separation between the professional and commercial classes which is in every way a social misfortune. I would hope that the completion of our system of education could be arranged to follow in the same lines, and not imitate the bad German example of educating the professional and commercial classes in different institutions. I mention these considerations in order to show how the nature of our whole system of education must be taken into consideration when deciding on the best form of superstructure to raise on it, and in order to explain my reasons for objecting to the proposal to transplant a German polytechnic from its place as the head of one system of education, and expect it to work satisfactorily as the head of a quite different system. If the experiment were now tried, there is no doubt that it would be doomed to years of failure. Our existing secondary and technical education is not at all suited to provide pupils qualified to use anything like a German polytechnic. Any institution on lines at all resembling this, and that was on at all a sufficiently large scale to meet our probable future requirements, would be either almost completely empty of pupils, or would be forced to take pupils who were entirely unfit to avail themselves of the teaching that should be given there. It will be many years before Ireland can expect to produce many pupils qualified in the same way that pupils in Germany are, when they leave the *real schulen* for polytechnics. In the meanwhile the whole institution would be getting into disrepute and along with it the proposal to benefit the country by a well-considered system of scientific and technical education. We must also bear in mind that the German system has been a by no means unqualified success. There is a fight of many years standing going on, as to whether *real schulen* pupils should or should not be admitted to universities, and along with this a competition between the *real schulen* and the gymnasiums, and between the polytechnics and the universities, which it would be most desirable for us over here to avoid, if we can, by learning from their experience and not making our arrangements a mere copy of theirs.

These considerations, namely (1) the necessity for knowing what system of technical education is to be completed; (2) the certainty that any adequate provision for the future would be for years far beyond our requirements, and would consequently bring the whole institution into ridicule, show that it would be entirely premature now to extend the Royal College of Science on its present lines. There is to my mind no doubt that a College with some of the lines of the present College very much extended, and with many other lines added, will be required, but I do not think it is possible to say how the present lines should be extended, nor what other lines should be added, without knowing what system of scientific and technical education is going to be introduced. The present seems a particularly inopportune time at which to decide what additional accommodation is required for the College. A Bill has just been promised dealing with Technical Education for Ireland, and it would be almost unconstitutional to decide one of the most important questions with regard to Technical Education, instead of leaving it to Parliament or to the body that they entrust with the duty of working a system of Technical Education in Ireland. There is then every reason for delaying the erection of a suitable College until there is some prospect of its being provided, by means of a working system of Science and Technical Education, with pupils qualified to use it. If the existing College be overcrowded, I have no doubt, from my knowledge of Irish Schools and what they produce, that a very elementary entrance examination would reduce the numbers below the accommodation available, and only exclude those who can avail themselves of the College only by the College devoting itself to elementary work of a kind that is by no means its proper business.

As regards the site of the proposed College, I do not think that that can be decided on without knowing what work it will have to do. This cannot be known until it has been decided not only what existing lines are to be extended, but also what new lines are to be taken up. As one important example among many of how the work to be done by the college will influence the choice of a site, I may instance the training of teachers. This is just one of the only directions in which the College in Dublin can expect to be of use to the whole of Ireland. As regards the other parts of its work it is most improbable that Belfast and Cork will be satisfied without having colleges of as high a class located in them as any in Dublin, but as regards the training of teachers there is a great deal to be said in favour of having one institution specialised for the purpose. The work of training teachers is essentially a specialised work, and it would be a waste of resources in Ireland to have several colleges specialising in this particular direction. It would anyway be well, in the first instance, to arrange for this to be carried on at some one place for Ireland, and this may consequently be looked upon as an almost certain development of the lines of the College in Dublin. At present the Royal College of Science in London and the City and Guilds of London Institute undertake this duty, one in respect of Science teachers and the other in respect of technical teachers. I assume that work of this kind carried on in these institutions is suitable for the proposed college in Dublin, and that it will train not only Science teachers but also teachers of technical subjects such as at present obtain certificates from the City and Guilds of London Institute. One of the matters specially brought under my notice as a member of the Commission on Manual Training during our recent visit to England was the desirability of some satisfactory method of providing a course of training for teachers of technical work, and a certificate of competency that might be recognised by school managers. Something of the same kind will be required in Ireland, but our circumstances are so different from those in England that I feel sure that we will require a special course of training for our Science and Technical teachers, just as we do at present for our elementary school teachers. Now this is a line quite outside those at present existing in the Royal College of Science, and one for which provision should be made, but for which provision cannot be made within the scope of the present inquiry because this inquiry is confined within the lines of the present college. It is, however, a question that is of serious importance in deciding upon the site of the college, as well as upon the accommodation and arrangements required. In order to provide proper means for training teachers very special arrangements are required. The arrangements available at South Kensington, in the two institutions there, are most inadequate. If Ireland is to be provided with a suitable Training College for teachers, the conditions for efficient training must be fulfilled. One of the essential conditions for training teachers properly is that the teachers in training shall have opportunities of seeing classes taught and of themselves practising the art of teaching. An essential adjunct to any efficient Training College is an efficient practising school. People who have not made a special study of the subject may not be aware of the practically universal consensus of opinion amongst educational authorities upon this subject. During my recent visit to England I took the opportunity of inquiring from those who had the management and inspection of schools in their hands, as to the necessity of opportunity for practical experience in teaching as part of the equipment of a Training College, and they one and all agreed as to its necessity, both in general and also for the training of Science and Technical teachers. This matter was made a special matter of investigation before the Royal Commission on Secondary Schools, which reported in August 1895. They have expressed the most decided opinion on the subject. They specially state that technical education is, in their opinion, a branch of secondary education, and they recommend that all teachers receive a training in the science and practice of their profession. This they explain to include practical training in schools under proper supervision; seeing classes taught by competent teachers and themselves teaching classes, subject to criticism and instruction as to improvement in their methods. This is the unanimous report of one of the most competent Commissions on educational matters ever appointed in England. It would be a very serious matter indeed to disregard this deliberate judgment of experts, after a laborious inquiry into this particular point, and I submit that Ireland would have very grave cause of complaint if provision were not made for carrying out this judgment in the Training College for the Science and Technical teachers for Ireland. Provision of practising schools could be made in two ways. One would be by the State providing Science and Technical schools in the neighbourhood of the Colleges, and the other would be by placing the College in the neighbourhood of technical schools for Dublin. This latter would be by far the preferable arrangement. It would be most unsatisfactory for the State, to start Science and Technical Schools in Dublin in competition with the City of Dublin Technical Schools. The fate of the Model Schools of Ireland, managed by a Government Board, should be a warning to all future generations as to the undesirability of this kind of competition. In Ireland it would almost certainly degenerate into a semi-denominational competition, and it is most sincerely to be hoped that denominational questions may be avoided in the future as in the past in the matter of Science and Technical Education. On the other hand, it is in contemplation to build central Technical Schools for the city of Dublin. There is no prospect that they will be erected anywhere except in the centre of the industrial part of the city. The sites that have been most frequently spoken of are in the neighbourhood of the Metal Bridge and between it and Lord Edward Street. There seems every likelihood that arrangement could be made for building a Technical College in the same neighbourhood so as to utilize the Technical Schools as practising school for the teachers in training at the College. It would be, of course, almost essential to have some joint management, but as it is evidently the present intention of Government to transferTechnical Education in Ireland to local control, there seems no reason to dismiss the proposal on account of a difficulty in joint management. To have the two institutions in the same neighbourhood and under joint management would also save a great deal of duplication of equipment. At present there is a very nice installation begun for teaching Electrical Engineering at Kevin Street Technical Schools, and it is quite evident that with competing institutions it will be practically impossible to prevent duplication of classes and consequent waste of energy, with the other disadvantages of competition between municipal and State institutions, unless some joint arrangements be come to. Already the Art classes are largely in duplicate, an arrangement that is most undesirable, and there is every prospect that in Ireland a political and denominational element will be introduced by such a competition.

One of the reasons why our institutions fail in being as efficient as the corresponding continental ones is that there is little or no co-ordination of ours. Abroad the Government compels each to work in its own department, and arranges for a gradation of institutions from the Elementary Schools to the Polytechnic. There is no prospect of such an interference with independent educational bodies in these countries, and the only way to secure that the overlapping and resultant duplication of work and competition for students that at present goes on in other branches may not invade the coming Technical Education here, is to make the various institutions in one city like Dublin connected together, and so worked together that there may be no waste power in duplication and competition.

There is nothing to prevent a Technical College such as I contemplate carrying on the most advanced work. The most advanced branches of Science, and its most complicated developments are intimately connected with the applications of Science, and no training of a teacher, or of a leader in industry, would be in any way satisfactory that did not involve his being trained to make original investigation. *Original research must be the keystone of advance;* and one of the reasons why our education for examinations has been most severely criticised is that it fails to cultivate research, and consequently fails to cultivate the best security for advance in our industries. Any Technical College that failed to make provision for the cultivation of original research would fail in one of its most essential parts, but there is no reason why such a college should not be connected with Technical Schools, and the connection would benefit both in the ways I have explained, and would, in addition, infuse a spirit of research throughout the combined institutions which would be of inestimable benefit to the schools, for it is of all things most difficult to cultivate this spirit in the lower departments of education.

I conclude, therefore, by recapitulating that I consider that no increased accommodation should be provided at present, and that no new buildings should be erected at present, and I advise this because I am convinced that we cannot now know what will be required, and that, if anything adequate to our probable requirements were erected, it would be for years of the nature of a white elephant and bring the institution into contempt.

(Signed) Geo. Francis FitzGerald.

APPENDIX 6.

Memorandum by Professor Maurice F. FitzGerald, Assoc. M.I.C.E., M.I.M.E., Professor of Engineering in Queen's College, Belfast.

The College of Science at present competes with other colleges for professional students on disadvantageous terms; the terms could not be effectually amended without introducing literary and medical courses wholly foreign to the general character of the College; and no sufficient supply of students seems likely to be found, so long as the College continues on its present lines.

The most hopeful opening for increased usefulness seems to me to lie in the direction of technical education. Several sources of students are to be found in this line, and I append some considerations about the best way of collecting students from them into a Technical College. The sources referred to are :—

A higher technical college.

Sources of students.

- (A.) The Dublin Technical School;
- (B.) Irish industries throughout the country;
- (C.) Irish technical schools, as requiring teachers;
- (D.) National schools, from the same point of view;

and I submit the following points regarding them—

- (*a*.) Lecture courses, and laboratory and workshop accommodation suiting technical instruction should be provided at low fees.

Lectures and workshops.

- (*b*.) Evening classes should be held, to accommodate students out of the Dublin schools, and others who might be taking apprenticeship in Dublin as part of their technical training.

Evening classes.

- (*c*.) It is important to get as many students as possible from source (B), Ireland generally. At present persons properly qualified to become leading hands, foremen, or managers are scarce in most parts of the country, few are prepared for higher training, and special inducements or assistance would be necessary to bring them to Dublin; but, after all, the supply from source (B) must depend, in the highest degree on the progress of technical education all over the country. Scholarships should, I think, involve apprenticeship or actual employment in some trade as a condition of tenure, in order to secure their *bonâ fide* technical character. In the highest classes, it is true, exceptions to this rule, permitting what might be called industrial research, may be allowable, but only under safeguards which would prevent the scholarships being abused for purely scientific purposes. I refer to teachers in training later on.

Suitable students depend on general progress.

Scholarships held by apprentices.

- (*d*.) I believe, however, that source B. could be better tapped through several comparatively small holes, than one large one, by establishing two or three good institutions in the

Two high schools.

Continental experience against centralised system.

provinces, rather than one great one in Dublin or any other centre. This travels outside the disposal of the College of Science, but I am glad I have permission to refer to it, and do not wish to go so far afield as to deal with lesser secondary schools. I think that two high schools, say one in Cork and one in Belfast, endowed to the value of 5,000*l.* or 6,000*l.* a year each, would be of far greater value than a single college in Dublin with 10,000*l.* or 12,000*l.* a year. Proper provision, at present wholly wanting, for a course in mechanical engineering in the Queen's College, along with a good technical school in the town, would, in Belfast, at any rate, fulfil the requirements of the case. The class of superior students who require a scientific mechanical engineer's training, corresponding to the present University course in civil engineering, would not then have to go abroad, as they now do; while the town school would supply the teaching needed by others who cannot interrupt their industrial life to the extent involved by higher scientific courses in a university. The limited space available in the grounds of Queen's College, Belfast, and its situation relatively to the town, both militate against the feasibility of uniting there the University and Polytechnic, particularly if the latter were to comprise the apparatus and staff belonging to a technical school of the *Werkmeisterschule* class. I do not find that a great central Polytechnic in the capital has been found necessary either as foundation or crown of an efficient technical education system in Würtemberg, France, Holland, Austria, or several other States; in fact the most lately developed systems on the Continent, founded on the experience gained in the older, have purposely avoided centralising influences, the opinions of such authorities as Dr. Steinbeis, of Würtemberg, Dr. Exner and M. Tisserand being against such influences. Local schools, not of the highest order, can provide teachers for the subsidiary ones, and after a while develop into, or cause to be developed, colleges of the highest class, much better than a cut and dried Polytechnic. In Ireland such an institution would, I fear, turn out to be for a good while a starving white elephant, unable to collect its own food.

Difference between technical and university systems.

It is, I think, easy to fall into a misapprehension as to the necessity for a single leading or central Polytechnic as either crown or foundation in a system of technical education, from drawing a false analogy of this, to a University system. The latter has for one of its principal functions, the duty of testing men's qualifications for various professional purposes, and conferring degrees and licenses accordingly; but, according to English ideas, it is completed apprenticeship which corresponds in trade to a license to practise a profession, and apprenticeship is outside a technical college; while materials and processes are most properly the subjects of test in higher technology.

Dublin for a polytechnic.

It is to be hoped that, if a great Polytechnic must be founded in Ireland now, Dublin will turn out to be the best place for it, since Dublin is otherwise convenient, and it is to be hoped that the north will not continue to be the only considerable industrial region in Ireland.

Museums.

(*e*.) Special museums form a part of most schemes of technical education. The old Museum of Industry, now the College of Science, contained what was intended to be a collection of the sort; I am no judge of its value, but it is generally admitted that, to be successful, technological museums should enlist, as collaborators in their management, such bodies as chambers of commerce, manufacturers' associations, and the like. Consequently, if the old museum were to be revived, its managing body would have to be suited to its purpose.

Training college.

Site.

Training colleges near schools.

Inconsistency.

Class that should supply teachers.

(*f*.) A supply of trained technical teachers will be for a while a matter of difficulty, which should be provided against. Assuming all necessary changes in courses and fittings to have been made, there is the objection of distance from the Dublin Technical School against the present site of the College of Science. If Dublin contained several important technical schools, and Ireland were dotted over with others of all grades, and the site of a Polytechnic, modelled on Zurich, say, to include a training college, were being considered this objection might perhaps have little weight. As things are, however, the creation of such an institution being, just now, premature, the objection is very weighty. Teachers in training must have school classes, similar to those they will be employed in teaching, at hand, and this principle is carried out in present practice; it would be inconsistent above all in technical education to provide teachers in training with every material, except their special one, that is, scholars; and every workshop, except their special one, the school-room. The teachers should, if possible, be drawn from the class who would attend the technical school (and the Dublin school must be a main source of supply for some time), if not, their educational bent is not sufficiently practical, and, when it comes to attracting persons of that class, my own experience in the Belfast Technical school, to say nothing of what is generally admitted, is quite sufficient to satisfy one of the extreme undesirability of half a mile distance between the technical school, and a science or art class of a higher or more abstract description.

National schools.

(*g*.) For National School science and manual exercise teacher's training, the College is not well adapted, either by site or otherwise; whether the National Board could utilize it is doubtful; it would have to be placed absolutely at their disposal at any rate, unless primary and secondary technical education are to be combined under some other authority.

Management of college.

(*h.*) If the College is to be converted to purposes of technical education it appears to me that its management should pass out of the hands of the Science and Art Department, because that Department was not organised or adapted to carry on the business of technical education; and should not, therefore, be called on to do so. As a scheme of technical education in Ireland, supplementary to that of the Agriculture and Industries Bill, is to be brought forward, it seems to me that, without precisely defining how it was to be utilized, the College might be handed over to whatever body has to work that scheme. In accordance with the views I have above expressed, an equivalent result would be arrived at if the College, as such, were extinguished, the site and buildings sold, and the money now annually spent on it, with the proceeds of the sale, devoted to the technical education scheme, under the control of the authority working that scheme.

Disposal of college.

Practical equivalent.

(Signed) MAURICE F. FITZGERALD.

Belfast, April 20, 1897.

APPENDIX 7.

MEMORANDUM SUBMITTED BY THE TECHNICAL EDUCATION ASSOCIATION FOR IRELAND TO THE COMMITTEE APPOINTED TO INQUIRE INTO THE QUESTION OF A SITE AND BUILDINGS FOR THE ROYAL COLLEGE OF SCIENCE.

On the 5th of March our honorary secretary, Mr. Arnold Graves, reported to us that, on the invitation of the Committee appointed to inquire into the question of a site and buildings for the Royal College of Science, he had had the honour of conferring with them, and had been invited to submit a memorandum on the subject. Prior to receiving this invitation, the Committee of the Technical Education Association for Ireland had been summoned to consider a communication from the Technical Education Committee. As it appeared to the Council of the Association that a memorandum would have more weight if it emanated from the association than from their honorary secretary, they instructed him to submit a report for their consideration, upon which the following memorandum is based.

In the first place we desire to express our satisfaction at this indication of the readiness of the Department to comply with the desire expressed by this Association in their correspondence with the Department to reorganize the Royal College of Science. At the same time, we would point out that since that correspondence circumstances have altered considerably and having regard to the statement of his Excellency the Lord Lieutenant, made last year to a deputation from this Association, that it was the intention of the Government to deal with the whole question of technical education in Ireland at the earliest possible opportunity; and having regard to the report of the Recess Committee, in which a comprehensive scheme of technical education for Ireland under an Irish department, including the reorganisation of the Royal College of Science under an Irish governing body, is sketched out, we believe that it would be premature for the Science and Art Department to deal separately with a portion of the larger subject. In expressing this opinion we feel that we are only echoing opinions recently expressed by the Chief Secretary for Ireland; for when an application was made to him by the committee of the Munster Dairy School for a grant to enable them to establish this school on a satisfactory basis, his reply was that it would be premature to deal with a part of a larger question until a Board of Agriculture was appointed to deal with the whole question of agricultural education. On a subsequent occasion when interrogated by Mr. Wiliam Field, M.P., as to the establishment of a Veterinary College for Ireland, he gave a similar answer, which commended itself to the good sense of the House.

Though we are strongly of opinion that the endowment of technical education in Ireland is a matter which will brook no delay, we feel that the question upon which this committee are called upon to report can very well stand over for the present. In our opinion, the Royal College of Science should form the apex of the system of Technical Education in this country; but until the foundation has been laid in the National Schools, and until arrangements have been made for establishing a system of intermediate Technical and Science Instruction, we are of opinion that it would be premature to reorganise the Royal College of Science.

It might be urged that a supply of trained science teachers is a condition precedent to the establishment of Intermediate Technical Schools and Science Classes. Our experience, however, convinces us that until a certain number of technical schools have been established in this country, which will afford employment for science teachers—until, in fact, young men begin to recognise science teaching as a regular profession—they will not embark upon it. But, even admitting the necessity of providing a staff of science teachers without delay, we would point out that though, under existing arrangements, large sums of money are expended in training science teachers in London, there are no indications that it is the intention of the Department to train science teachers at the Royal College of Science for Ireland.

We are not in the confidence of the Department, and are, therefore, unaware of their views on the subject; but we may say confidently that the general opinion in Ireland is that the Royal College of Science, though, in some respects, a most successful institution, is, to a large extent, a failure for the special objects for which it was founded; and though we agree with the Department in thinking that the present buildings are wholly inadequate, we think it would be injudicious to erect large buildings, and to increase the establishment, if it is to be reorganised on existing lines. We agree with the Recess Committee in recommending that this institution should be converted, later on, into a great National Technical College, where young men would receive the highest forms of technical and science instruction, which would qualify them to become managers of works; to conduct research in science applied to manufactures and industry; and to become science teachers at technical or organised science schools.

But before anything is done to decide upon a site and buildings for a Royal College of Science, which would form the apex of a general scheme of technical education, the scheme itself should be decided upon, and the relations of its various parts to the Royal College of Science considered. How is it possible to decide what buildings will be required until it is first determined what facilities it is desirable to establish at the College? And this is a very large question, which we submit should be left to the mature consideration of an Irish department, charged with the control of technical education, and should not be decided at the present time by the officers of the Science and Art Department.

If, as part of the new scheme of industrial and agricultural development, it is decided to make provision for the endowment of research on the lines adopted in foreign countries, laboratories should be erected and salaries paid to experts for conducting inquiries in chemistry, physics, and biology, as applied to manufacture and industry. Again, one of the most important questions affecting technical education is the training of science teachers for elementary schools; and it would be a matter for mature consideration whether or not these teachers should be trained under the directions of the National Board, or under the department having charge of science instruction in Ireland. The question of the training in teaching of science teachers for local science schools has still to be considered; while the relation of the new Veterinary College to Trinity College and to the Royal College of Science is under discussion. These are all considerations which occur to us at once, and there may be others of equal importance, which would have to be carefully weighed before a conclusion could be arrived at as to the extent of the site, and of the buildings to be erected.

Even if the buildings decided upon were large enough for all purposes, it would be a serious mistake to erect them until the exact purpose of each part is decided. Laboratories, and even Science class-rooms, must be carefully planned for the particular purpose for which they are required, and it would be premature to build until some idea had been formed as to the number of pupils likely to require instruction in the different subjects.

At the present time there is a strong consensus of opinion in Ireland in favour of placing Science, Art, and Technical Instruction under an Irish Department. To confine the reorganization of the Royal College of Science at this period to the Science and Art Department would be regarded as an indication that it is not the intention of the Government to recognise our claim to local control in this matter; and on this ground alone it would be strongly opposed.

The matter is a delicate one, and it is one which it would take years to accomplish. To commence that change under the Science and Art Department, and to complete it under an Irish Department, would be objected to as changing horses while crossing the stream.

The mere fact that the change has been initiated by South Kensington would be a strong argument in favour of adopting a course which we should deplore, viz.:—leaving the control of Science and Art instruction in Ireland under the Science and Art Department for the next four or five years. For this reason alone, if for no other, we think it would be desirable to postpone the inquiry.

The Department have given no indication of their intention to expend anything upon other form of technical education in the immediate future; and it may be concluded that they have put this matter forward as the first thing to be done in relation to technical education in this country. From this view we differ, and we would respectfully submit, if it is the intention of the Government to vote any sum in the immediate future for technical education in Ireland, that assistance should be given in increasing the grants to local authorities for the purposes of elementary and intermediate Technical Science and Art instruction, and for the erection of Technical Science and Art Schools. If, however, such provision were made, we should welcome the offer to erect new buildings for a reorganised College of Science, provided that its reorganisation is dealt with as part of a general scheme of Technical Education for the whole country.

APPENDIX 8.

LETTER FROM THE REGISTRAR OF THE QUEEN'S COLLEGE, BELFAST.

Queen's College, Belfast,
26th March 1897.

DEAR SIR,

I AM directed by the Council of this College to acknowledge your Chairman's letter of 22nd instant, informing us that a Committee has been appointed by the Government to report (*a*) what accommodation is required for the Royal College of Science for Ireland, and (*b*) where the College should be built, if new buildings are required, and asking us for a statement of our views on these points.

I am desired to say that the College of Science, St. Stephen's Green, Dublin, is little known here, nor, so far as we are aware, is advantage taken of it by the North of Ireland, so that we are not in a position to say definitely what answers should be given to the questions proposed.

There should be a good opening in Ireland for a first class institution working mainly with evening classes, adapted both as to fees and as to courses to the preparation of students for the Science and Art Department and the technological examinations. Classes of that kind are attended by several hundred students in Belfast, and there would be here at any rate a good supply of students, many of whom would probably be supplied from amongst apprentices in works of various kinds in this city.

A first class institution adapted to the needs of such persons, especially those of the better class, who expect to occupy the position of foreman or manager, would require ample workshop accommodation such as would allow of technical instruction in the subjects locally aided by the Science and Art Department under the present system.

I am, &c.
(Signed) J. PURSER,
Registrar.

To the Secretary,
Departmental Committee,
Science and Art Department,
South Kensington.

APPENDIX 9.

LETTER FROM THE SECRETARY OF THE CHAMBER OF COMMERCE, DUBLIN.

Chamber of Commerce, Dublin,
12th April 1897.

DEAR SIR,

I BROUGHT your letter of the 22nd ultimo before the Council of this Chamber at their meeting to-day, which was the first meeting held since it was received.

They desire me to bring under your notice the enclosed copy of two resolutions which were passed by them in the year 1895, and also of a resolution adopted by them this day, on the subject of Technical Education.

By these you will see that the Council have taken great interest in the subject. They have also appointed a Committee to enquire further into the matter, and hope to communicate with you at some future time.

I am, dear Sir,
Yours truly,
(Signed) Marcus Goodbody,
Hon. Secretary.

W. G. Lambert, Esq.,
Secretary, Departmental Committee
on Science and Art Buildings,
Royal College of Science,
Stephen's Green, Dublin.

TECHNICAL EDUCATION.

1st *Resolution.*

"That we approve of the Bill to amend the law relating to Technical Education in Ireland, introduced by the Technical Education Association, and request the members for the city to support it. That we trust the Government will avail themselves of the opportunity which the Bill affords of providing a suitable endowment for Technical Education in Ireland, and that a copy of this resolution be forwarded to the Chief Secretary for Ireland, and the Technical Education Association for Ireland."

2nd *Resolution.*

"That in the judgment of the Council it would be extremely desirable to enlarge the scope of the education in applied science afforded by the Royal College of Science so as to embrace various important departments of Technical Education, and that this opinion be respectfully submitted to Mr. Acland, Vice-President of the Council and Minister of Education. A copy of this minute to be forwarded to him."

3rd *Resolution.*

"That this Council is of opinion that the proposed new buildings in connexion with the Science and Art Department should be under Irish control and affiliated to the proposed Board of Agriculture."

APPENDIX 10.

LETTER FROM THE SECRETARY OF THE CHAMBER OF COMMERCE, BELFAST.

Chamber of Commerce, Belfast,
9th April 1897.

SIR,

YOUR letter of 22nd ultimo from South Kensington, asking the opinion of this Chamber on the two points mentioned, viz., (*a*) what accommodation is required for the Royal College of Science for Ireland, and (*b*) where the College should be built, if new buildings are required, was before the Council of the Chamber yesterday and was fully considered by them.

I am instructed to say in reply that the Council do not consider it necessary to send members to confer with your Committee at present, and are satisfied to place their views before you in writing.

Unaware as the Council are of the extent and scope of the College, they are unable to express any opinion with regard to Question (*a*), but with regard to Question (*b*), they have no hesitation in saying that, having regard to the manufacturing and commercial importance of this city, a college should be established in Belfast instead of extending the existing College in Dublin, and we hope this will be decided on.

As compared with Dublin, Belfast enjoys few, one might say none, of the advantages conferred upon the former city by the constant and liberal expenditure there of public funds for museums, libraries, art galleries, &c., and Belfast feels that she has a perfect right to participate in such advantages.

Should your Committee, however, not see their way to recommend such a step as the establishment of a college here, then the Council would urge on the three Departments named in your letter, viz., the Science and Art Department, the Irish Government, and the Treasury, the necessity for liberal grants for the establishment and maintenance of a first-class, fully-equipped Technical School, and also a School of Art in this city.

We notice that our Lord Mayor and Town Clerk had an interview with the Chief Secretary yesterday on the general subject, but we are unaware of what passed on the occasion.

I am, Sir,
Your most obedient Servant,
SAMUEL VANCE,
Secretary.
pro B. W. LANGHERY
Assistant Secretary.

To Captain W. de W. Abney, C.B., F.R.S.,
Chairman Departmental Committee,
Royal College of Science,
Stephen's Green, Dublin.

APPENDIX 11.

MEMORANDUM by Professor A. W. RÜCKER, M.A., Sec. R.S.

I have been asked whether it is in my opinion desirable that a Scientific College, in which advanced instruction is given, should be worked in connexion with a school where the students of the College could be exercised in the art of giving instruction? In answer, I can only reply that I think such an arrangement to be quite unnecessary.

During his student days a lad learns something of the art of teaching from observing how he himself is taught. When he begins to teach it is, no doubt, desirable that he should at first be an assistant working under some one who can give him hints. We have an elaborate system by which our best students remain for a year or two at the College as junior assistants. If it were intended to extend this system, it would not be well to flood the College with immature teachers, but to make arrangements for distributing them among other institutions.

To use one neighbouring school or college for this purpose would be quite useless. The little bits of lecturing and laboratory teaching which it would be possible to assign to each one of a considerable number of teachers in training would not be worth much.

I do not believe that it is possible to do more in the way of helping future teachers (in addition, of course, to giving them a good education) than (1) to draw attention to points on which elementary teachers are known to go wrong; (2) to teach them to make apparatus for themselves; (3) to accustom them to good teaching and experimenting with simple apparatus; (4) to encourage students' societies where they practise lecturing and speaking without the hampering presence of a professor; (5) to plant them out as assistants under as favourable circumstances as possible.

All these, except the last, can be done without an auxiliary institution, and the last cannot be done satisfactorily in one auxiliary institution only. I do not, therefore, think that proximity to a school is of any importance in choosing the site of a University College.

(Signed) ARTHUR W. RÜCKER.

APPENDIX 12.

MEMORANDUM by PROFESSOR W. F. BARRETT, F.R.S.E., M.R.I.A., Dean of the Faculty (1893–94), Royal College of Science for Ireland.

I am glad to have the opportunity of putting in writing a somewhat fuller reply than I gave yesterday to the question addressed me by the Chairman of the Committee on the above subject.*

It is undeniable that Science teachers, like all other teachers, should have some special training that will (*a*) help to prepare them for their future career, and (*b*) test their fitness for that career. The question is what kind of training is best adapted to meet their case?

The issue appears to be restricted to this—is a training in pedagogy, (such as is conducted at the Training Colleges where a student takes a junior class before his teacher and the rest of his class-mates, and is afterwards criticised by them on his method of teaching), the best system to follow for Science teachers in training?

Undoubtedly this method has been most useful for the ordinary run of teachers and preachers—for a similar method is adopted in Theological Colleges. But it does not meet the case of those who have to illustrate their teaching by experimental demonstration, and this latter is essential to teachers of Physics and Chemistry. I have seen the most skilled literary and mathematical teachers as helpless as a child when they have attempted to introduce the very simplest experimental illustration into their lectures.

My own view, formed after upwards of 26 years' experience in Science teaching (24 at this College), and after a generation of Science teachers have passed through my hands, is that practice in laboratory work, acquaintance with *things* and not merely words about things, combined with love of teaching and a scientific enthusiasm, are the best preparation for a successful Science teacher; assuming, of course, that he has had a sound training in theory. During the latter part of his College course every Science teacher in training should in my opinion be required (*a*) to undertake in turn the preparation of the experiments required to illustrate the lectures of his Professor, under the eye and guidance of the Professor and his assistant; (*b*) to have regular practice in tutorial work in the laboratory under guidance as before; (*c*) he should also be encouraged to deliver occasional papers to his class-mates and to other classes in the

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* The general principles which underlie the teaching of Science formed the subject of an address I delivered four years ago to the Irish National School Teachers, and printed at their request. A copy of this I have already taken the liberty of presenting to the Committee.

College on special subjects that he selects and makes his own for the time. This should be followed by the delivery of brief courses of lectures, to which the public might be invited. The preparation and delivery of a brief course of lectures is one of the best ways of obtaining that clear and logical arrangement of ideas which is the great need of young teachers.

There will never be that large demand for Science teachers that there is for other teachers, so that methods quite practicable when there are comparatively few teachers in training would of course be impracticable when there are a large number passing out every year.

It is training such as I have described that former Demonstrators here have gone through and enabled them to obtain teaching appointments elsewhere. Only within the present year my present temporary assistant and former student, Mr. Jefcoat, was selected for the principalship of the new Technical Schools at Limerick by a small committee of which Mr. Arnold Graves was the chairman, mainly because he had received training such as I have here described.

These, I think, are the main points I wish to lay before the Committee in connexion with this subject, and I will only add in conclusion that even, if it were desirable to give Science teachers some practice in pedagogy, such as is followed at the Training Colleges, it is far easier and better for them occasionally to attend some evening Science or Technical school, where they have obtained permission to take a class, than to erect a new College of Science in propinquity to some primary Science or Technical school; simply because of the desirability of Science teachers in training occasionally taking such a class before they leave the College. Moreover, the site for a Central Normal School of Science and Technical College for Ireland should, in my opinion, be entirely detached from any one local primary Science or Technical school, and should be in a central and commanding position in the metropolis of Ireland, with ready access to the National Library and Natural History Museum.

(Signed) W. F. Barrett.

Royal College of Science,
June 4, 1897.

APPENDIX 13.

Memorandum by Professor W. N. Hartley, F.R.S., F.C.S., F.R.S.E.

The question of site is one which involves the question of space available.

The space required depends upon the scope of the College curriculum.

In dealing with College buildings which are necessarily of a composite character containing—1, lecture rooms; 2, laboratories; 3, library and reading rooms; 4, offices; 5, museums for the several teaching collections; 6, apparatus and instrument rooms; 7, store rooms; it is very desirable that those objects which accumulate and which no money could replace should be secured from damage by fire, water, or corrosive gases.

In this category I would place especially books and instruments. It is, therefore, very desirable that the Chemical Laboratory, or rather the whole Chemical Department should be separated from the main building, because the risk from fire is so great, and the escape of noxious gases, which even in very small quantity are deleterious, is practically unavoidable.

(Signed) W. N. HARTLEY.

APPENDIX 14.

SUGGESTIONS MADE BY REPRESENTATIVES OF THE IRISH INDUSTRIAL LEAGUE.

(1.) That the vacant chairs of Agriculture and Naval Architecture be filled, *especially the former*.

(2.) That the course of instruction be no longer confined to day work, but that *evening* class-lectures be given in Electricity, Applied Mechanics, Descriptive Geometry, Inorganic Chemistry, Agriculture, Economic Botany, Economic Geology, Naval Architecture, and Steam.

(3.) That "Industrial Certificates" be issued, on the lines of the Diploma of the Associateship in the Faculty of Manufactures, but embracing more subjects, and having elementary ones which might be obtained by the industrial classes, to whom the standard of the Associateship is too high.

APPENDIX 15.

Office of Public Works,
22nd April 1897.

SIR,

IN reply to your letter of 12th instant, I am directed to state that the Board are not in a position to make any suggestions as to the disposal of the premises at present occupied by the Royal College of Science in the event of their ceasing to be required for that institution. No specific appropriation of the house in that event is at present in the contemplation of the Board.

It is possible that it may prove desirable to transfer to it certain offices at present located in buildings held for short terms or on yearly tenancy. Until the necessities of the Public Service at the time of surrender by the Science and Art Department have been ascertained, it is not practicable to form a definite opinion on the subject.

It may be stated that the premises are held under a lease, the interest in which was purchased by the Board in 1846 for 1,500*l.*, for 999 years from 1830, at a rent of 203*l.* 6*s.* per annum.

I am, Sir,
Your obedient Servant,
(Signed) H. Williams,
Secretary.

W. G. Lambert, Esq.,
Secretary, Royal College of Science,
Dublin.

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1. III. 99

REPORT

OF THE

COMMITTEE

APPOINTED TO INQUIRE INTO THE

BUILDINGS AND SITE

OF THE

ROYAL COLLEGE OF SCIENCE FOR IRELAND, DUBLIN.

Presented to both Houses of Parliament by Command of Her Majesty.

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